REMARKS

Claims 1 to 3 are pending in the present application. Applicants respectfully submit that the pending claims are patentable for at least the following reasons, and reconsideration is therefore respectfully requested.

I. Rejection of Claims 1 to 3 Under 35 U.S.C. §103(a)

Claims 1 to 3 stand rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent Number 5,648,995 ("Mardon et al.") in view of United States Patent Number 4,649,023 ("Sabol et al.") and United States Patent Number 5,832,050 ("Rebeyrolle et al."). It is respectfully submitted that these rejections should be withdrawn for at least the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Applicants respectfully submit that a prima facie case of obviousness has not been established in regard to the pending claims.

Mardon et al. is directed to a method of manufacturing a tube for a nuclear fuel assembly, and tubes obtained thereby. Mardon et al. discloses "zirconium-based alloy tubes also containing 50 ppm to 250 ppm iron, 0.8% to 1.3% by weight niobium, less than 1600 ppm oxygen, less than 200 ppm carbon, and less than 120 ppm silicon." Mardon et al., col. 1, lines 47-50.

Sabol et al. is directed to a process for fabricating a zirconium-niobium alloy and articles resulting therefrom. According to Sabol et al., "[a]rticles, such as tubing, which have excellent corrosion resistance to steam at elevated temperatures and to hydriding, are produced from zirconium alloys containing 0.5 to 2.0 percent niobium, up to 1.5 percent tin, and up to 0.25 percent of *a third alloying element* such as iron, chromium, molybdenum, vanadium, copper, nickel and tungsten." Sabol et al., abstract (emphasis added).

Rebeyrolle et al. is directed to a zirconium-based alloy, manufacturing process, and use in a nuclear reactor. Rebeyrolle et al. discloses that "[t]he alloy has a base composition similar to that of a zirconium alloy of known type used for the manufacture of an element intended for use in the core of a nuclear reactor, such as a cladding tube, a guide tube, or another structural element of a fuel assembly. In addition, the alloy contains sulphur in a proportion by weight of between 8 and 100 ppm and preferably between 8 and 30 ppm." Rebeyrolle et al., abstract.

In contrast to the teachings of Mardon et al. in view of Sabol et al. and Rebeyrolle et al., the zirconium based alloy of the present invention, as currently recited in independent claims 1 and 2, includes "Fe and at least one of the elements selected from the group consisting of Cr and V, a total of the contents in Fe and Cr + V being 200 to 700 ppm." Claim 3 depends from claim 1 and thus includes this claim limitation as well.

In addition, there is no teaching, motivation nor suggestion in Mardon et al., Sabol et al. or Rebeyrolle et al., or in the prior art, to combine these patents and to modify their teachings in order to arrive at the presently claimed invention. Although the Office Action states that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to add chromium or vanadium in an amount of up to 0.25%, as disclosed by Sabol et al. ('023), to the zirconium-based alloy that is made into tubing for nuclear rods, as disclosed by Mardon et al. ('995), in order to obtain a higher corrosion resistance" (Office Action mailed December 6, 2006, page 3), Applicants respectfully disagree. That is, Applicants respectfully submit that

the Examiner is not considering the entire scope of the teachings of both Sabol et al. and Mardon et al. When considering a reference, the reference must be considered as a whole, including those portions that lead away from the presently claimed invention. *See W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Nowhere in Sabol et al. is it suggested that there could be a significant presence of several of the seven alloying elements cited therein (iron, chromium, molybdenum, vanadium, copper, nickel and tungsten) as the third element of the composition. In fact, iron is used throughout the examples as the third alloying element (*see* Sabol et al., Tables I-III), and Sabol et al. repeatedly refers to "a" or "the" third alloying element, not to several third alloying elements (*see, e.g.,* Sabol et al., col. 2, lines 11, 50, 59, 66). To that end, Applicants also note the composition listed in Table IV of Sabol et al. wherein 0.1% (*i.e.*, 1000 ppm) of Fe is present in the alloy, yet Cr, Cu, Ni and W are specified as being present only at an impurity level, and V and Mo are not even present. That is, the joint presence of more than one of these elements in the alloy is not taught nor suggested by this composition, and certainly not in a range of 200 to 700 ppm of "a total of the contents in Fe and Cr + V," as is recited in the pending claims.

Furthermore, Mardon et al. describes how Zircaloy 4 alloys, which contain chromium, produce sheaths with a mechanical strength which "has been found to be satisfactory, however their corrosion by pressurized water at high temperature has limited the length of time they can be kept in a reactor." Mardon et al., col. 1, lines 24-27. Mardon et al. goes on to disclose a zirconium-based alloy tube also containing 50 ppm to 250 ppm iron, 0.8% to 1.3% by weight niobium, less than 1600 ppm oxygen, less than 200 ppm carbon, and less than 120 ppm silicon, which "has simultaneously good resistance to corrosion in a high temperature aqueous medium and satisfactory high temperature creep behavior, without that giving rise to manufacturing difficulties leading to a high reject rate." Mardon et al., col. 1, lines 41-45. As such, Mardon et al. is directed to niobium-containing zirconium-based alloys, as a purported improvement to the referenced

chromium-containing zirconium-based alloys. Thus, Mardon et al. actually teaches away from adding chromium to the zirconium-based alloy disclosed therein, as it teaches that such addition results in sheaths having less than satisfactory corrosion characteristics.

To that end, Applicants also note that in the figure of Mardon et al., it can be seen that the effect of creep resistance improvement appears quite suddenly and sharply, under 250 ppm of iron. Per Mardon et al., this result was unexpected; however, Mardon et al. provides no explanation as to why this occurred, such that one of ordinary skill in the art would not have guidance as to what potential changes could be made to the alloys of Mardon et al. while retaining the advantages disclosed therein. In particular, nothing would suggest to one of ordinary skill in the art that adding chromium and/or vanadium to the iron, as is required by the presently claimed invention, would result in an alloy retaining the excellent creep resistance shown in Mardon et al. To the contrary, by introducing chromium and/or vanadium to the alloy of Mardon et al., one would, *inter alia*, modify the chemical nature of the precipitates, and the effects of this modification on the resulting alloy would not be easily predictable. Thus, even if one of ordinary skill in the art reading Mardon et al. were to modify its teaching as described above, there would be no reasonable expectation of obtaining a successful outcome.

Applicants also point out that the iron content as disclosed in Mardon et al. (*i.e.*, 50-250 ppm) requires a drastic limitation of ferrous impurities introduced with the raw materials of the zirconium alloy (which may contain up to 1500 ppm of iron according to the ASTM standards[1]). Such an alloy stands in contrast to the alloy disclosed in Sabol et al. wherein iron is repeatedly used throughout the examples at a level of 0.1% (*i.e.*, 1000 ppm). *See* Sabol et al., Tables I-IV. Similarly, whereas tin is not taught to be a component of the alloy disclosed in Mardon et al., tin is repeatedly used throughout the examples of Sabol et al. at a level of 1.0% (*i.e.*, 10,000 ppm). *See id.* Such

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[1] For the convenience of the Examiner, Applicants have attached hereto (and included in an accompanying Information Disclosure Statement) a copy of the document entitled ASTM B349-93 *Standard Specification for Zirconium Sponge and Other Forms of Virgin Metal for Nuclear Application* (1993), which shows the aforementioned level of 1500 ppm of iron in Table 1 therein.

teachings of Mardon et al. and Sabol et al. would serve to further dissuade one of ordinary skill in the art to combine the teachings of these two patents.

Moreover, neither Mardon et al. nor Sabol et al. teaches or suggests an alloy having simultaneously the very low levels of tin, carbon and silicon as currently recited in the pending claims. In Mardon et al., tin is not taught to be deliberately added to the alloy disclosed therein, such that if present, it would only be at a typical impurity level for tin. Also, the alloy disclosed in Mardon et al. includes carbon (less than 200 ppm) and silicon (less than 120 ppm) at typical impurity levels. In Sabol et al., on the other hand, the alloy levels of carbon and silicon can be explicitly low (*see* Sabol et al., Table IV), while the alloy level of tin can be as high as 1.5%, and the examples therein include tin at a level of 1.0% (*i.e.*, 10,000 ppm) (*see* Sabol et al., Tables I-IV). Thus, based on these high alloy tin levels as disclosed in Sabol et al., one of ordinary skill in the art would be dissuaded from limiting the tin content in a zirconium based alloy to 100 ppm or less, as is required by the presently claimed invention. That is, there would be no motivation or suggestion for one of ordinary skill in the art to modify the teaching of Sabol et al. in this manner.

Therefore, for at least the preceding reasons, Applicants respectfully submit that the pending claims are not rendered obvious by Mardon et al. in view of Sabol et al. and Rebeyrolle et al. Thus, it is respectfully submitted that the rejection of the claims based on these patents should be withdrawn.

II. Rejection of Claims 1 and 2 Under Nonstatutory Obviousness-Type Double Patenting

Claims 1 and 2 stand rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 9 of United States Patent Number 6,863,745. This obviousness-type double patenting rejection has been noted by the Applicants. If these claims are eventually found otherwise allowable, a terminal disclaimer would be timely filed in accordance with 37 C.F.R. § 1.321 in order to obviate this obviousness-type double patenting rejection.

III. Conclusion

In view of the foregoing, it is respectfully submitted that all pending claims of the present application are now in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,
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